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COMMUNICATION AND ACTION PROTOCOL FOR FAILED BACTERIOLOGICAL RESULTS IN DRINKING WATER

FOR

WATERWORKS SYSTEMS AUTHORIZED UNDER THE ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT

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1.0 Discussion

Providing clean water has become a challenge with new knowledge and information about emerging pathogens in source waters. Waterworks systems must be designed and operated to ensure microbiologically safe drinking water even under the worst possible raw water quality scenario. Effective particle removal and efficient disinfection are the two principal treatment measures for ensuring microbiologically safe drinking water. Turbidity and disinfection residual measurements are therefore, the two most important ongoing tests related to microbiological water quality. The testing for bacteria in drinking water is an important component for ensuring microbiologically safe drinking water. A positive coliform test or presence of *Escherichia coli (E.coli)* may indicate a system failure requiring immediate action. This protocol is intended to ensure that test results that exceed the bacteriological criteria as described in the latest edition of the *Guidelines for Canadian Drinking Water Quality* are transmitted to the appropriate parties so that follow-up action can be taken immediately.

2.0 Information / Database

2.1 Alberta Environment (AENV) Data Base

AENV will develop and maintain an electronic database to contain:

i) a list of the regulated waterworks systems under its jurisdiction; the waterworks system operator / contact person and his/her telephone and fax numbers;

ii) the AENV district offices; each district contact person and his / her telephone and fax numbers; and the 24 hour AENV complaint / emergency telephone numbers;

iii) the Regional Health Authority (RHA) offices; each district contact person and his / her telephone and fax numbers; and the 24 hour emergency contact number if available;

iv) Alberta Health and Wellness regular work hours telephone numbers, and the Provincial Health Officer or the Deputy Provincial Health Officer 24 hour pager number;

v) Health Canada (HC) regular work hours telephone number, and the 24 hour emergency contact number; and

vi) AENV approved waterworks systems that supply drinking water to the First Nations.

AENV will make this database available to the Provincial Laboratory for Public Health (Microbiology) {PLPH(M)}, HC and the RHAs. AENV will also update this list, and notify PLPH(M), HC and the RHAs from time to time if a new waterworks system is approved or registered. The AENV database attached forms a part of this protocol.

2.2 Bacteriological Quality Database

PLPH(M), EPCOR, and the City of Calgary will independently maintain all analytical results for the tests carried out by them in an electronic database. This information will be made available to AENV, Alberta Health and Wellness, HC and the RHAs as requested.

3.0 Compliance requirement for bacteriological quality

3.1 Sampling

Bacteriological samples shall be collected from representative points after treatment and throughout the distribution system after the first service connection. A second sample shall be collected at the same time and place and tested for total chlorine.

The owner/operator of the waterworks systems in consultation with the PLPH(M) will ensure that they have an adequate supply of sampling bottles to meet the bacteriological quality monitoring requirement in the Approval. The owner/operator of the waterworks systems will be responsible for completing the requisition form, attaching the identification sticker to each sample bottle, and collecting and shipping of the samples to reach PLPH(M) within 24 hours. In collecting the samples, care shall be taken to wash hands before sampling, remove tap screens, and disinfect outside of the tap with alcohol or bleach. All water samples shall be transported in coolers with ice packs (not loose ice) to preserve the quality of the samples. The laboratory will not process samples if any of the following conditions apply:

i) there is no identification number sticker attached to the bottle;

ii) the sample received is not in the standard microbiological bottle;

iii) the identification number on the requisition form does not match the number on the bottle;

iv) the sample (without coolant) is received more than 6 hours after collection;

v) the sample is received more than 24 hours after collection;

vi) the sample is frozen upon receipt;

vii) the Date and Time of collection are not indicated; or

viii) the bottle is received with a broken cap.

PLPH(M) will fax the owner / operator of the waterworks system on the same day, if the samples will not be processed for analysis.

The minimum frequency of sampling, to be evenly distributed in the sampling period, is based on the following table:

Population Served	Number of Samples per Month
up to 5 000	4
5 000 to 90 000	1 per 1 000 population
more than 90 000	90 + (1 per 10 000 population)

Additional sampling will be required if poor water quality is suspected or Maximum Acceptable Concentration (MAC) for bacteriological quality is exceeded, as outlined in 6.2. Less frequent sampling may be allowed based on site-specific conditions, at the discretion of the AENV Approvals Manager.

3.2 Analysis

Presence – Absence (P-A) coliform / *E.coli* tests using defined substrate media method shall be used in analysing the first sample. If samples produce a positive P-A result for coliform / *E.coli*, other appropriate methods shall be used to analyse the repeat samples to determine the coliform / *E.coli* densities.

Analysis for compliance monitoring is to be done at the government owned PLPH(M). Exception to this requirement is the compliance monitoring for distribution system within the boundaries of the Cities of Edmonton and Calgary, where a minimum of 50% of the compliance monitoring must be done at the PLPH(M).

3.3 Maximum Acceptable Concentration (MAC)

The maximum acceptable concentration (MAC) for bacteriological quality of public, semi-public, and private drinking water systems is no coliforms detectable per 100 mL. However, because coliforms are not uniformly distributed in water and are subject to considerable variation in public health significance, drinking water that fulfills the following conditions is considered to conform to this MAC:

i) no sample shall contain *E.coli*; or

ii) no consecutive samples from the same site or not more than 10% of samples from the distribution system in a given calendar month shall show the presence of total coliform bacteria.

4.0 Notification for emergency operation of the plant

4.1 Notifying RHAs of emergency operation of the plant

If the owner / operator of a waterworks system notifies AENV of any emergency operation of the water treatment plant, as noted below, then AENV shall obtain and share this information with the RHAs as soon as possible:

i) if the free or combined chlorine concentrations at the water treatment plant or the total chlorine concentrations in the distribution system fall below the stipulated limits in the Approval;

ii) if a structural failure or equipment malfunction occurs within the water treatment plant or water distribution system that will impact the drinking water quality; or

iii) if the combined filter turbidity for the water entering the clear well, surpasses the never to be exceeded limit stipulated in the Approval.

5.0 Notification for presence of microorganisms

5.1 If total coliform organisms or E.coli are detected from a single sample; the following notification procedures apply:

i) PLPH(M) will fax a copy of the results on the same day the results are known to the:

(a) owner/operator of the waterworks system where the sample was collected;

(b) district office of the RHA where the waterworks system is located;

(c) district office of AENV where the waterworks system is located; and

(d) HC, if the subject waterworks system also supplies drinking water to a first nation.

Outside of regular work hours (between 3:30 p.m. and 8:00 am on week days and at all times during the weekends and on statutory holidays), in addition to the fax notification, PLPH(M) will also telephone the 24 hour complaint / emergency line which connects to the Environmental Response Centre of AENV, and the 24 hour emergency contact numbers of the RHAs and HC.

6.0 Follow-up procedure and intervention

As soon as the fax or telephone notification is received by AENV, the Compliance Section of the District Office, in collaboration with the Approvals Engineer, and the RHA shall work with the system owner / operator to plan a strategy which shall include, at a minimum, the following actions:

6.1 Corrective actions

The owner / operator will conduct a detailed check of the plant performance, disinfection dosages and residuals, the finished water quality (turbidity, particle counts, etc.), any spill events or main breaks in the distribution system, and would undertake to:

i) optimize the treatment process for surface water systems, if turbidity exceeds 0.5 NTU;

ii) increase disinfectant dosage and monitoring frequency for residual chlorine; and/or

iii) flush water mains until chlorine residual is detected.

AENV will verify the above actions by the owner / operator.

6.2 Repeat samples

The system owner / operator will:

i) collect and submit for analysis a set of repeat samples, consisting of three repeat samples for every sample in which the total coliforms or *E.coli* are detected. One sample from each of the following sites for a total of three repeat samples should be collected after localized flushing:

(a) at the site of previous sample; and

(b) within 5 active services upstream of the site of previous sample, or at the potable water reservoir for small systems; and

(c) within 5 active services downstream of the site of previous sample.

These samples shall be clearly identified as "Repeat Samples" on the requisition forms, which accompany samples to the laboratory.

ii) collect and submit a set of repeat samples for analysis within twenty-four hours after notification by PLPH(M). In the event the repeat sampling is conducted on a Thursday or Friday, the owner/operator shall inform the PLPH(M) that weekend analysis is required, and advise AENV and RHAs accordingly. Shipping and pick-up of samples shall be co-ordinated with the laboratories by the owner/operator. PLPH(M) will fax on the same day all results of repeat samples, both passed and failed, to system owner / operator, AENV, HC and RHAs. Outside of regular work hours (between 3:30 p.m. and 8:00 am on week days and at all times during the weekends and on statutory holidays), in addition to the fax notification, PLPH(M) will also telephone the 24 hour complaint / emergency line which connects to the Environmental Response Centre of AENV, and the 24 hour emergency contact number of HC and RHAs, only in the case of samples which show the presence of total coliform or *E.coli*.

iii) collect and submit one additional set of repeat samples for each of the incidents, when repeat samples have coliform or *E.coli* detected. Based on the magnitude and the extent of the problem, AENV may revise this procedure on a site-specific basis, but the sampling will be continued until the problem is resolved.

iv) monitor and record total chlorine concentrations at each sampling site.

AENV will verify the above actions by the owner / operator

7.0 Public health intervention

7.1 Issuing a boil water advisory

i) An executive officer of a RHA may issue an immediate boil water advisory if in his/her opinion a condition presents itself as a potential public health concern that requires immediate intervention to safeguard the public's health. Such conditions include but are not limited to:

(a) structural or equipment malfunction or concerns that exist within the water plant or distribution system;

(b) one or a combination of physical, bacteriological or chemical analyses that in his or her opinion presents a public health concern;

(c) surpass the never to be exceeded combined filter turbidity for the water entering the clear well stipulated in the Approval; or

(d) increase in number of cases of illnesses in the community.

ii) Notwithstanding the above, if the repeat samples taken under 6.2i) contain *E.coli*, then a boil water advisory shall be issued to the community served by the waterworks system, subject to Note (b) and (c) in this section.

If re-sampling confirms the presence of total coliforms in the absence of *E.coli*, the degree of response will depend largely on the circumstance, magnitude and the extent of the problem. If the presence of total coliforms is linked to a main break, or the count is low (less than 10 organisms per 100 mL) and confined to a small area, then corrective actions as detailed earlier should be continued. If the total coliform count is high (greater than 10 organisms per 100 mL) and the problem is widespread, then a boil water advisory is to be issued.

iii) The owner / operator of the waterworks system is responsible for communicating the advisory to the consumers. RHAs may provide additional direction with regard to communicating the advisory to *high risk facilities* such as child care centres, long term care facilities, hospitals, hotels, ice manufacturers, etc.

iv) RHAs will notify officials of Alberta Health and Wellness (Environmental Health Services during regular work hours and the Provincial Health Officer or the Deputy Provincial Health Officer outside regular work hours) as soon as practical of any boil water advisory carried out pursuant to this protocol.

Note:

(a) If there exists a *Public Health Intervention Protocol* for a particular waterworks system, or a new one developed, that is:

- endorsed by the RHA, AENV, HC and the system owner;
- not in conflict with any of the procedures stipulated in this protocol; and
- more stringent than the procedures stipulated in this protocol,

then RHAs / HC may follow that protocol for public health intervention.

(b) for large systems, serving greater than 20,000 people, at the discretion of RHAs, the boil water advisory may be confined only to those areas directly affected by the distribution network, and not necessarily the whole community served by the distribution system.

(c) if a positive bacteriological sample can be distinguished as an internal building / complex problem, then, at the discretion of the RHAs, the boil water advisory may be confined to that building / complex.

7.2 Rescinding a boil water advisory

The boil water advisory will be rescinded when the RHA is satisfied that a risk to public health no longer exists. The following criteria should be applied as appropriate to the situation:

i) the treatment or distribution malfunction has been corrected and sufficient water displacement has occurred in the distribution system to eliminate any remaining contaminated water;

ii) turbidity, disinfection residual or particle counts of the treated water have returned to acceptable levels;

iii) at least two consecutive sets of samples collected in two consecutive days have no coliforms;

iv) any other actions or verifications deemed necessary to assure that public health is being protected.

8.0 Establishing the cause of contamination

AENV Compliance Section will follow-up with the owner/operator of the system to determine the cause of the microbial contamination, and ensure that measures are put in place so that the incident will not be repeated. The owner/operator will follow up with a written report of the incident to AENV and RHAs within seven days of discovery of the problem.